

Adaptive control for a biological process under input saturation and unknown control gain via dead-zone Lyapunov functions

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1 Introduction

In this manuscript, submitted for publication in the Journal Applied Sciences, authors propose an adaptive controller for a biological process with unknown varying control gain, input saturation and uncertain reaction rate. They mathematically prove several properties for the adaptive control and finally the authors present some numerical results that illustrate the performance of the proposed controller.

2 Comments

- Broad Comments.
 - My main observation refers to the fundamental contribution of the work and is the design of the adaptive control. The control design made in section 3 is very confusing for me, they perform a series of mathematical manipulations that are not properly motivated. For example, authors introduce in formula (9) a truncated Lyapunov function inspired in a previous work but authors do not motivate this inspiration and the properties that it has. In formula (12) authors introduce the term $K_{1b}|f_{z1}|$ in order to provide robustness but they do not clarify the need for this term or what it contributes to robustness. In formula (54) they introduce a control law for u without motivation, etc. The entire section must be rewritten so that the mathematical process underlying the definition of the control is understood.
- Specific Comments.
 - Assumption 2.1. Authors assume that the state variables x_1 , x_2 and x_3 are bounded for a bounded control v . They also assume that the state variables are non negative. The question is, can this assumption be deduced from the state system under more restrictive hypothesis? Is it a realistic assumption?
 - In formula (5) it is necessary to clarify how the differential operator works. In principle, as the formula is written, it is not clear how this differential operator works.
 - Line 337 were.
 - Authors say in line 338 that *The procedure is clear and detailed so that it can be applied to other second order nonlinear systems*. This claim is not conveniently justified.

3 Conclusion

In my opinion, the manuscript can not be accepted in the current format due to the previous comments.